

Program I. **EXPRESSIONS AND OPERATIONS**

SOL Topic:

A.12

The student will factor completely first-and second-degree binomials and trinomials in one or two variables. The graphing calculator will be used as both a primary tool for factoring and for confirming an algebraic factorization.

Activity 1 : Demonstrate how to connect factors, zeros, and graphs using the quadratic equation $x^2 - x - 6 = 0$.

Instruction :

- Type the quadratic equation into $Y_1 = x^2 - x - 6$
- Typing the factors into $Y_2 = (x - 3)(x + 2)$ (Use the Style key)
- Graph in a Zoom Standard Window
- Observe the tables, are they the same?

Activity 2: Algebraically determine the factors of other given polynomials, then Support graphically and numerically.

Review of the different types of factoring such as the Difference of Two Squares, Trinomials, and Monomials

Type the following polynomials in $Y_1 =$,

then type each polynomial in factored form into $Y_2 =$

- $x^2 - 4$
- $x^2 + 10x + 21$
- $x^2 - 9x + 20$
- $6x^2 + 11x + 3$
- $x^3 + 10x^2 + 21x$

Activity 3: Determine if an equation, $ax^2 + bx + c = 0$, can be factored using the Discriminant “ $b^2 - 4ac$ ” on the home screen.

For the equation:

- $y = x^2 + 7x + 10$

- Let $a = 1$, $b = 7$, $c = 10$
- Type $1 \rightarrow a$: $7 \rightarrow b$: $10 \rightarrow c$: $b^2 - 4ac$
- If the answer is a positive perfect square, then the trinomial can be factored.
- If the answer is not a positive perfect square, then the trinomial cannot be factored.
- ENTER the answer is “9”. (A perfect square numeral)

Now try the equation:

- $y = x^2 + 2x + 8$
- $1 \rightarrow a$: $2 \rightarrow b$: $8 \rightarrow c$: $b^2 - 4ac$
- “ENTER”, the answer is “- 28”
- The equation cannot be factored.

Activity 4: Using the Test Menu and Boolean Algebra to support factoring a trinomial graphically . Use the “Y =” window.

- $Y_1 = (x^2 + 10x + 21) = (x + 3)(x + 7)$ and graph in a Zoom 4 window.

A true statement results in a line at $y = 1$ and a false statement results in a line at $y = 0$ for all values of x . This statement is true.

Activity 5: Use Boolean Algebra to support binomial multiplication numerically on the “home screen”.

Store:

- $10 \rightarrow x$: $(x + 3)^2 = x^2 + 9$ on the home screen. Press enter.

A true statement results in a value = 1 and a false statement results in a value = 0. This statement is false for all values of x .

Try: $(x + 3)^2 = x^2 + 6x + 9$ This statement is true for all values of x .

Activity 6: Given the product of two binomials in “Y₁=”, use FOIL to expand the binomials in “Y₂=” to obtain the quadratic.

Type on the “Y =” window:

- $Y_1 = (x - 1)(x + 2)$
- $Y_2 = x^2 + 2x - x - 2$
- $Y_3 = x^2 + x - 2$

Show that the graphs are identical.

On the home screen show the connection between arithmetic and algebra

- $(10 - 1)(10 + 2) = (9)(12)$
- show using FOIL that $100 + 20 - 10 - 2 = 108$ in simplifying the above

**Activity 7: Investigating signed numbers and operations on the Graph Screen.
(addition and subtraction)**

Using the cursor keys, we will visually observe the movement of the cursor to be represented on the graph screen as adding or subtracting signed numbers.

- On the graph screen “Y =” clear,
- Zoom 6 (Standard Window),
- Zoom 8 (Integer Window)

- Examples: $-5 - 3 = -8$
 $-5 - (-3) = -2$
- $-5 + 3 = -2$

From the origin, move the cursor to the left five times observing the x-value, then move the cursor to the left three times observing the final x-value. The cursor falls on -8.

Addition is a move to the right and subtraction is a move to the left.

Activity 8: Investigating signed number operations on the Home Screen.

Addition, subtraction, multiplication and division using order of operations and signed numbers. Type the same examples on the home screen.

- Examples: $-5 - 3 = -8$
 $-5 - (-3) = -2$
- $-5 + 3 = -2$

